Minimally invasive cosmetic dentistry
A concept and treatment protocol for general practice

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Increased media coverage and the availability of free Web-based information has lead to heightened public awareness and, thus, to a dramatic increase in patients’ aesthetic expectations, desires and demands. Today, a glowing, healthy and vibrant smile is no longer the exclusive domain of the rich and famous, and most general practitioners are forced to incorporate various aesthetic treatment modalities in their daily practices to meet this growing demand.

The treatment modalities of any healthcare service are aimed at the establishment of health and the conservation of the human body with its natural function and aesthetics. The concept of minimally invasive (MI) treatment was initially introduced in the medical field and was adapted in dentistry in the early 1970s with the application of diamine silver fluoride.1

This was followed by the development of preventive resin restorations (PRR) in the 1980s and the atraumatic restorative treatment (ART) approach and Carisolv in the 1990s.

The major components of MI dentistry are the risk assessment of the disease with a focus on early detection and prevention; external and internal re-mineralisation; use of a range of restorations; bio-compatible dental materials and equipment; and surgical intervention only when required and only after any existing disease has been controlled.2–11

Current basic treatment protocols (TPs) and approaches in MI dentistry are the use of air abrasion, laser treatment or sonic abrasion to gain cavity access and excavate infected carious tooth tissue through selective caries removal or laser treatment;2–13 cavity restorations by applying ART, PRR or sandwich restorations; and the use of computer-controlled local anaesthesia delivery systems4 with emphasis on the repair of a failed restoration rather than its replacement.11–13

Thus far, the focus of MI dentistry has been on caries-related topics14 and has not been comprehensively adopted in other fields of dentistry. Dr. Miles Markley, one of the great leaders of preventive dentistry, advocated that the loss of even a part of a human tooth should be considered a serious injury and that dentistry’s goal should be to preserve healthy and natural tooth structure.

His words are much more relevant in today’s cosmetic dental practice, in which the demand for cosmetic procedures is rapidly increasing. With the treatment approach trend toward the more invasive protocols, millions of healthy teeth are aggressively prepared each year in the name of smile makeovers and instant orthodontics, neglecting the long-term health, function and aesthetics of the oral tissues.

The need for a new concept
Contemporary aesthetic dentistry demands well-considered concepts and TPs that provide a simple, comprehensive, patient-friendly and MI approach with an emphasis on psychology, health, function and aesthetics (PHFA) (Fig. 1).

The need for a holistic concept and basic treatment guidelines was expressed by concerned practitioners, aesthetic dentistry associations and academics around the world for the following basic reasons:

• Owing to an increased aesthetic demand, aesthetic dentistry is becoming an integral part of general dentistry. The aesthetic outcome of any dental treatment plays a vital role in the patient’s treatment satisfaction criteria.

• The treatment modalities of contemporary cosmetic dentistry are trending toward more invasive procedures with an over-utilisation of crowns, bridges, thick full veneers and invasive periodontal aesthetic surgeries, while neglecting long-term oral health, actual aesthetic needs and the characteristics of the patient.

• Social trust in dentistry is degrading, owing to the trend of fulfilling the cosmetic demands of patients without ethical consideration and sufficient scientific background (the more you replace, the more you earn; a “more is more” mentality).

In this article, I introduce a concept and TP for minimally invasive cosmetic dentistry (MICD), in order to address these facts properly and integrate the evidence-based MI philosophy and its application into aesthetic dentistry.

Defining MICD
As the perception of aesthetics and beauty is extremely subjective and largely influenced by personal beliefs, trends, fashion and input from the media, a universally applicable definition is not available.

Hence, smile aesthetics is a multifactorial issue that needs to be adequately addressed during aesthetic treatment.16 MICD deals both with subjective and objective issues.

Therefore, in this article I define MICD as “a holistic approach that explores the smile defects and aesthetic desires of a patient at an early stage and treats them using the least intervention options in diagnosis and treatment technology by considering the psycholo-
The core MICD principles are:

- application of the “sooner-the-better” approach and exploration of the patient’s smile defects and aesthetic desires at an early stage in order to minimise invasive treatments in the future;
- smile design in consideration of the psychology, health, function and aesthetics (Smile Design Wheel)\(^{18}\) of the patient;
- adoption of the “do no harm” strategy in the selection of treatment procedures and the maximum possible preservation of healthy oral tissues;
- selection of dental materials and equipment that support MI treatment options in an evidence-based approach;
- encouragement of the “keep in touch” relationship with the patient to facilitate regular maintenance, timely repair and strict evaluation of the aesthetic work performed.

The main MICD benefits include:

- promotion of health, function and aesthetics of the oral issues and a positive impact on the patient’s quality of life;
- preservation of sound tooth structures (banking the tooth structure), while achieving the desired aesthetic result;
- reduction of treatment fear and increased patient confidence;
- promotion of trust and enhancement of professional image.

The MICD treatment protocol

In my experience, the TPs that are currently in use in aesthetic dentistry are mostly based on more invasive techniques and procedures. With the use of such protocols, cosmetic dentists are knowningly, or unknowingly, heading toward the over-utilisation of invasive technologies in their practices, which is becoming a professional and ethical concern.

The basic aim of the MICD TP is to guide practitioners in achieving optimum results with as little intervention as possible.

The intervention level of the treatment in MICD depends on the type of smile defects and the aesthetic needs (objective measurement and subjective perception) of the patient.

The basic framework and pathway of the MICD TP are illustrated in Figures 2 and 3. It is to be noted that the TP in medical and dental sciences must be dynamic in nature and should be flexible to incorporate evidence-based facts.

Therefore, I have outlined the MICD core principles that are required to achieve the optimum result in terms of health, function and aesthetics with minimum intervention and optimal patient satisfaction. However, it is the practitioner’s duty to incorporate all the necessary guidelines, protocols and regulations of the authority concerned (state or affiliated professional organisations) into the MICD TP.

Phase I: understand

In the first step of Phase I, the perception, lifestyle, personality and desires of the patient are explored. The primary goal of this first step is a better patient-dentist understanding. As the aesthetic perceptions of the dentist and the patient may differ, it is imperative to understand the subjective aesthetic perception of the patient.

Various types of questions, personal interviews and visual aids can be used as supporting tools. In this step, the practitioner should ask the patient to complete the MICD self-smile evaluation form. The information obtained will help estimate the perceived smile aesthetic score (a-score) and will be used as the baseline data in the evaluation step.

Next, diseases, force elements and aesthetic defects of smile are explored. Information on the medical and dental history, general health and specific health (oral-facial) of the patient is collected and complete dental and periodontal charting is performed.

In order to understand the force elements, the existing occlusion, comfort and muscular activity, speech and phonetics are thoroughly examined with the evaluation of para-functional and other oral habits, comfort during mastication and deglutition and temporomandibular joints (TMJ) movements.

The necessary diagnostic tests, photographic documentation and the diagnostic study models are prepared during this step for the further exploration of existing diseases, force elements and aesthetic defects.

In the following step, the data collected is analysed in relation to the accepted normal values of a patient’s sex, race and age (SRA) factors.

The aesthetic components of the smile are analysed in detail grouped into macro- (facial and dental midline relation, facial profile, symmetry of the facial thirds and hemi-faces), mini- (visibility of upper anterior teeth, smile arc, smile symmetry, buccal corridor, display zone, smile index and lip line) and micro-aesthetics (dental: central dominance, tooth proportion, axial inclination, incisal embrasure, contact-point progression, shade progression, surface texture; gingival: shape, contour, embrasure and zenith height).

The practitioner can now grade the smile in terms of the patient’s health, function and aesthetics as follows:

- Grade A: The established parameters of oral health, function and aesthetics are fully satisfied.
tion and aesthetics are within nor-
mal limits and aesthetic enhance-
ment is required only to fulfill the
patient’s cosmetic desires.
• Grade B: The established
parameters of oral health and func-
tion are within normal limits; how-
ever, the aesthetic parameters are
below the accepted level. Aesthetic
enhancement can further improve
the aesthetic parameters.
• Grade C: The established
parameters of oral health or func-
tion or both are below the normal
limits. An establishment treatment
is mandatory prior to aesthetic
enhancement.

From the above, the practitioner
will obtain a smile aesthetic grad-
ing in terms of the patient’s health,
function and aesthetics, as well as
a complete overview over the smile
aesthetic problems and the macro-, mini- and micro-smile defects.

The patient’s PHFA factors are
the four fundamental components
of aesthetic dentistry and must
be respected to achieve healthy,
harmonious and beautiful smiles.
The design step depends on the
information obtained from explo-
ratio and analysis.

The information on psychology
is subjective in nature; however,
health, function and aesthetic anal-
ysis provide the objective informa-
tion that will guide the design
with the various established and
basic principles of smile aesthetics
and also the feasible and practical
extent of the aesthetic desires of
the patient.

The aesthetic mock-up, manu-
al tracing, digital makeover and
smile catalogues are some of the
popular tools used in this step.
A new smile, alternative designs,
types of treatments involved, com-
plexity, possible risk factors and
complications, treatment limita-
tion and tentative costs should be
established during this step.

For easy application, the aes-
thetic treatments in MICD are cat-
egorised as follows:
• Type I: micro-aesthetic com-
ponents;
• Type II: mini-aesthetic compo-
nents; and
• Type III: macro-aesthetic com-
ponents: facial and dental midline
relation, facial profile, symmetry
of facial thirds and hemi-faces.

As the treatment modal-
ity depends on the professional
capability and experience of the
practitioner, simple and practical
methods are used to categorise the
MICD treatment complexity:
• Grade I: Treatment that may
require consultation with a spe-
cialist (preventive, simple oral
surgery/endodontics/periodon-
tics/implants, short orthodontics);
• Grade II: Treatment that
requires the procedural involve-
ment of other dental specialists
(complex endodontics/periodon-
tics/orthodontics), but not oral
and maxillofacial surgery or plas-
tic surgery; and
• Grade III: Treatment that
requires the procedural involve-
ment of oral and maxillofacial sur-
gery or plastic surgery.

With the aid of this simple
grating system, any practitioner
can determine the complexity of
the treatment involved for the
accomplishment of a new smile
design for an individual patient
and can plan for the necessary
multidisciplinary support.

The last step of this phase is
the most important in MICD TP
because in this step the patient is
presented with an image of his or
her future smile. Visual aids, such
as a smile catalogue, aesthetic
mock-ups, manual sketches, mod-
ified digital pictures, computer-
designed makeovers or anima-
tions can be used as presentation
tools.

The results of the design step
are systematically presented to the
patient with professional honesty
and ethics. All pertinent queries of
the patient related to the proposed
smile need to be addressed during
demonstration.

The treatment complexity, its
limitations, the risks involved,
possible complications, treatment
cost estimation and maintenance
responsibility must properly be
explained to the patient.

The patient is thus involved in
finalising the treatment plan and
will sign the written informed
consent form before proceeding to
Phase II.

Phase II: achieve
As per the TP, which is finalised
during the presentation step, all
necessary preventive interceptive
and restorative (curative) dental
treatments are conducted in order
to establish the proper health and
function of the oral tissues.

Owing to the complexity of the
treatment, a multidisciplinary
approach may be necessary for a
good result.

Once the case is stable in terms
of health (controlled disease)
and function (balanced force ele-
ments) with good oral habits, the
patient is requested to re-evaluate
his or her smile in terms of aes-
thetics with the help of the MICD
self-smile re-evaluation form.

This is important because in
some cases the patient is fully

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Fig. 4a: Gummy smile with lack of upper central dominance.

Fig. 4b: Harmonised smile with proper central dominance. Treated with MI approach.

Fig. 5a: Smile after establishment treatment.

Fig. 5b: Smile aesthetic enhancement with non-invasive veneers treatment.